in said etching chamber;

an evacuation system which evacuates said etching chamber by an evacuation system;

an etching gas supply which supplies an etching gas into said etching chamber;

a plasma generator which generates a plasma for performing etching of said sample in said etching chamber; and

a temperature controller which circulates a heat exchanging medium through the interior of said exchangeable jacket during etching so as to at least control a temperature of a surface of said exchangeable jacket which faces the plasma in said etching chamber within a predetermined range and enables depositing of a coating layer on the surface of said exchangeable jacket during etching which prevents the surface of said exchangeable jacket from being etched by said plasma.

22. A plasma etching apparatus according to claim 21, wherein said temperature controller circulates said heat exchanging medium so as to control the temperature of the surface of said exchangeable jacket in a range of 0 to 50°C.

23. A plasma etching apparatus according to claim 21, wherein the coating layer is deposited up to a maximum thickness which does not peel off during etching of the

sample.

24. A plasma etching apparatus according to claim 23, wherein the maximum thickness of the coating layer includes a thickness of 200 microns.

25. A plasma etching apparatus according to claim 21, wherein the heat exchanging medium is a refrigerant.

26. A plasma etching apparatus for etching a sample comprising:

an etching chamber having the sidewall;

an exchangeable jacket for protecting the sidewall of the etching chamber;

a sample holder which holds a sample to be etched within the etching chamber;

means for generating a plasma and for etching the sample within the etching chamber; and

means for preventing etching of a surface of the exchangeable jacket which is held inside of the sidewall of the etching chamber and faces the plasma during etching of the sample by depositing a coating film on the surface of the exchangeable jacket facing the plasma during etching of the sample.

27. A plasma etching apparatus according to claim 26, wherein the means for preventing etching of the surface of the exchangeable jacket includes a temperature controller which circulates a heat exchanging medium through the interior of said exchangeable jacket during etching of the sample so as to at least control a temperature of the surface of said exchangeable jacket which faces the plasma in said etching chamber within a predetermined range.

28. A plasma etching apparatus according to claim 27, wherein said temperature controller circulates said heat exchanging medium so as to control the temperature of the surface of said exchangeable jacket in a range of 0 to 50°C.

~~28~~ 29. A plasma etching apparatus according to claim 27, wherein the coating layer is deposited up to a maximum thickness which does not peel off during etching of the sample.

~~29~~ 30. A plasma etching apparatus according to claim 28, wherein the maximum thickness of the coating layer includes a thickness of 200 microns.

~~30~~ 31. A plasma etching apparatus according to claim 27, wherein the heat exchanging medium is a refrigerant.--